Tree Farm Licence 3
Slocan Forest Products

Timber Emphasis
VRI Ground Sampling
Project Implementation Plan

PREPARED BY:
MINISTRY OF FORESTS
NELSON FOREST REGION

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EXECUTIVE SUMMARY

This is a VRI Project Implementation Plan (VPIP) for the timber emphasis VRI ground sampling in Tree Farm Licence 3 (TFL 3), issued to Slocan Forest Products Limited.. The target population is the Vegetated Treed (VT) portion of the TFL, excluding Parks and other legally recognized Protected Areas, and woodlots. Sample polygons will be selected from stands greater than 20 years old in the target population using stratified probability proportional to size with replacement (PPSWR) sampling, with the strata based on forest type (leading-species groups) and total polygon volume. The 20 year old restriction is applied due to the uncertainty of using the young stands in the analysis. The ground sampling will be completed in the 2001 field season. Approximately 90 ground samples will be established. The intent of the ground sampling is to adjust the inventory

This plan was reviewed and approved by RIB June 12, 2001.

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1. INTRODUCTION

1.1 Background

This VRI Project Implementation Plan (VPIP) outlines ground sampling activities for the timber emphasis VRI ground sampling in TFL 3. The Ministry of Forests-Nelson Forest Region (NFR) prepared this VPIP in consultation with Slocan Forest Products and Resources Inventory Branch (RIB). This VPIP is based, in part, on the Arrow Forest District VRI Strategic Inventory Plan (VSIP) finalized in March, 1999. A glossary of terms is provided in Appendix A.

1.2 Rationale

This timber emphasis VRI is motivated by the 1995 TFL 3 mature (over 60 years old) inventory audit that indicated that heights were overestimated by an average of 3.5m. The overestimation was not confined to any one species group. The inventory audit ratio for volume was not statistically significant, however, the 13% volume difference between the inventory and the audit is a concern. The TFL has just had a VRI retrofit done which did not address the height problem. Ground sampling followed by statistical adjustment would correct this observed bias in the TFL.

2. SAMPLING PLAN

2.1 Overview

The information in this section includes a description of the landbase, inventory objectives, target population, sample size and selection, and the VRI tools to be used.

2.2 Landbase

TFL 3 is approximately 79,566 ha, of which approximately 59,567ha is forested (Table 1). The main tree species are spruce (28%), balsam (25%), douglas fir (15%), and hemlock (11%) (Table 2).

Table 1. TFL3 landbase.

Land Classification	Area (ha)	%
Forest land	59567	74.9
Immature	27532	46.2
Mature	22601	37.9
Non-Productive	8554	14.4
Not Stocked	880	1.5
Non-Forest	19455	24.4
No Typing Available	544	0.7
Total	*79566*	*100*

2.3 Inventory Objectives

The main objective of the timber emphasis inventory is to:

> *Install an adequate number of VRI sample clusters to adjust the timber inventory in the TFL3 Vegetated Treed (VT) areas to achieve a sampling error of ±10% (95% probability) for overall net timber volume in the VT* > 20 years of age..

Table 2. TFL 3 forested landbase by species

Leading Species	Area (ha)	%
Spruce	16968	28.5
Balsam	15092	25.3
Douglas Fir	8882	14.9
Hemlock	6376	10.7
Larch	5706	9.6
Lodgepole pine	3710	6.2
Cedar	1846	3.1
Birch	510	0.9
Other*	477	0.8
Total	*5956*	*100*

*Aspen, White Pine, WhiteBark Pine, Cottonwood, Ponderosa Pine

Net timber volume is gross volume minus stumps, tops, decay, waste, and breakage. Decay and waste are normally estimated using VRI call grading/net factoring and NVAF sampling. In the absence of the NVAF adjustment, the 1976 MOF Forest Inventory Zone Decay, Waste and Breakage factors will be used to net down gross merchantable volume.

2.4 Target Population

The target population is the VT portion, greater than 20 years old, of the TFL. The RIB official file will be sampled. According to this file, the target population area is 59670.37 ha. It should be noted that this is the first VRI ground sample project that has elected to not sample stands < 20 years of age. In approving this population for sampling RIB has assumed that the licensee has a reliable database of stands between 0 and 20 years (good silvicultural data) and that there are not large areas of young stands <20 yrs with unreliable information.

2.5 Sample Size

The recommended sample size for this project is 90 samples. Table 3 shows the sample sizes for 10% sampling error at 95% confidence for two different Coefficients of Variation (CV). The first CV, 43.3%, was the CV that was determined from the inventory audit conducted in 1995. The second CV, 54.1%, is the original CV inflated by 25% to incorporate any unknowns in the population. It is not known which CV is closer to the actual. Since there is such a large difference between the two sample sizes, it was decided to use a sample size that was somewhere between the two estimates, and that still fit the proposed budget for the year.

Table 3. Recommended sample sizes for differing CVs.

CV	Sample Size
43.3	75
54.1	115

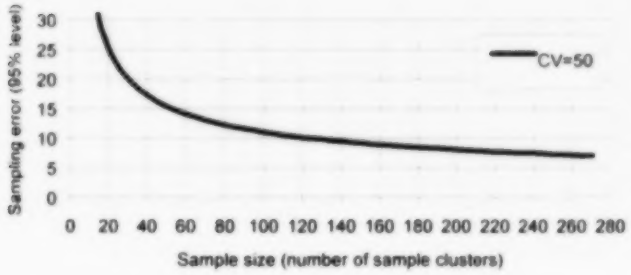

Figure 1. Decreasing sampling error with increasing sample size.[1]

2.6 Sample Selection

RIB selected sample polygons using the new stratified probability proportional to size with replacement (PPSWR) sample selection method and the existing official Phase I file. An explanation of the methodology can be found in Appendix B. Stratification was based on leading species and polygon volume per hectare. Sample allocation to individual leading-species strata and substrata was proportional to strata or sub-strata areas. PPSWR was applied to each sub-stratum. The selected samples can be found in Appendix C. Comparison of the VT population and the sample proportions is provided in Appendix D. One hundred ten samples were selected in case there is a need to increase sample size or replace some of the samples.

2.7 Measurements

VRI timber certified crews will be used to gather data following the current VRI *Ground Sampling Manual*. The following Card Types will be used: 1-3, and 8-11.

[1]The CV, or coefficient of variation, is estimated from the inventory audit data.

2.8 Net Volume Adjustment Factor Sampling

This sampling is optional, however, the NVAF sample clusters will be identified. NVAF sampling involves detailed stem analysis of sample trees, calculation of actual net volume, and calculation of the ratio between actual net volume and estimated net volume (where estimated net volume is obtained from net factoring and taper equations). Trees would be selected at random from a number of the Phase II sample clusters and would be destructively sampled for NVAF. The exact number of live and dead trees to sample will be determined when, and if, the Licensee decides to pursue NVAF sampling.

3. IMPLEMENTATION PLAN

3.1 Schedule –

The VRI will be implemented in 2001 as follows:

1. Select the sample polygons (May) (RIB).
2. Prepare and submit a VPIP (this Plan) for approval by the stakeholders (April) (NFR).
3. Select sample locations in polygons (May) (RIB).
4. Prepare sample packages; each to include photo stereo-pair for access, document photo photocopies, sample cluster location map (1:10,000), and access maps (1:20,000) (May) (Licensee).
5. Tender and select contract crews, and award contracts (/May) (Licensee).
6. Locate and measure the sample clusters (June-August) (Field crews).
7. Conduct quality assurance (10% check) (June-August) (NFR).
8. Validate and compile data from completed sample clusters and prepare inventory summary reports (June-September) (RIB).
9. Conduct statistical analysis (using the "Fraser process" as the current minimum standard) (September) (Contractor)
10. RIB to review analysis/adjustment
11. Adjust inventory files prior to timber supply analysis (October) (Contractor)

3.2 Sample Packages

Field sample packages should include most current photo stereo-pairs for access, copy of document photo (where possible), sample cluster location maps (1:5,000), and access maps (1:20,000) clearly indicating sample cluster location and polygon boundaries; and overview maps (1:250,000) for

general polygon location. Maps will be plotted showing the VRI grid overlays and selected sample locations. Sample locations within a polygon will be selected using GIS.

3.3 Project Support

The MOF will provide technical assistance, quality assurance, and validation and compilation of field data.

3.4 Fieldwork

Fieldwork will be completed using VRI measurement protocols and VRI timber-certified crews. The VRI Card Types 1-3 and 8-11 will be completed according the most current VRI Ground Sampling procedures.

3.5 Quality Assurance

Quality assurance must be conducted. The VRI quality assurance standards require inspection of at least 10% of the samples. The field crews are responsible for the quality control of their own work.

3.6 Data Compilation, Analysis, and Adjustment

The RIB will complete data compilation; contract field crews will do data entry. The statistical analysis and database adjustment will be done by a consultant. The RIB will assist with technical aspects of the analysis and review the final product. RIB will also assist with technical aspects of the database adjustment. Standards for licensee data base adjustment are still under development.

3.7 Roles and Responsibilities

Ministry of Forests

The MOF will:

- Select the sample polygons (RIB).
- Select sample locations within polygons (NFR).
- Conduct sample cluster quality assurance (NFR)
- Check data after initial compilation (NFR).
- Validate and compile data (RIB).
- Provide minimum standards for statistical analysis (RIB).
- Prepare and sign-off Standards Agreement and Schedule A (NFR)
- Provide mentor for field crews at the start of fieldwork. (NFR).
- Ensure quality assurance is complete (NFR).

Slocan Forest Products:

- Prepare RFP and hire contractors for field work
- Ensure sample packages are assembled and complete

Field work contractors

- Complete field sampling.
- Digital data entry and submission to RIB.

3.8 Monitoring

The RIB is responsible for monitoring this VPIP and its approval.

4. APPENDIX A – GLOSSARY OF TERMS

Ground Sampling

Ground sampling is the field measurement of timber, ecology, range, and/or coarse woody debris values at one or more locations within each sample polygon. Sample polygons are selected proportional to their area from a sorted list. To accommodate a wide variety of resources, various types and sizes of sampling units (e.g., fixed and variable plots, transects) are used to make the measurements.

Net Volume Adjustment Factor (NVAF) Sampling

NVAF sampling provides factors to adjust net tree volume estimated from net factoring and taper equations. The adjustment accounts for hidden decay and possible taper equation bias. NVAF sampling involves detailed stem analysis of sample trees, calculation of actual net volume, and calculation of the ratio between actual net volume and estimated net volume (where estimated net volume is obtained from net factoring and taper equations).

Post-Stratification

Post-stratification involves dividing inventory unit into mutually exclusive sub-populations (strata) *after* ground sampling has been completed. Samples that fall in each post-stratum are analyzed separately and the results are applied to the corresponding population post-strata to improve the precision of the inventory's overall averages and totals.

Pre-Stratification

Pre-stratification divides an inventory unit into mutually exclusive sub-populations (strata) *before* ground sampling to provide estimates for specific areas, or to increase the confidence in the overall estimates by considering special characteristics of each stratum.

PPSWR (Probability Proportional to Size With Replacement)

This is a sample selection method in which samples (polygons) are selected with probability proportional to their size. That is, the larger polygons have a higher chance of being included in the sample. The process groups polygons into leading species strata. The species strata polygons are then grouped into substrata based on total polygon volume. Samples are then randomly selected

within the species/volume strata (with replacement) proportional to the distribution within the population.

Retrofit

Retrofitting is the process of translating and upgrading an existing photo-based inventory to VRI standards. If the polygon linework and attributes are of acceptable quality, the existing FIP (Forest Inventory Planning) databases are translated to VIF (Vegetation Inventory Files) databases and the additional attributes required by the VRI are re-estimated from aerial photographs.

Sample Size

The sample size for an inventory is the minimum number of ground samples to be established in an inventory unit to meet the target precision.

Statistical Analysis

Statistical analysis is the process of adjusting the values of the photo-interpretation variables using ground sampling observations. For each sampled polygon, ground observations are compared to photo-estimated values to develop an adjustment factor. This factor is then applied to all polygons in the photo interpretation database to produce the final adjusted database.

Sub-unit

Sub-unit describes the inventory unit of a management inventory (i.e., the management inventory target population is a subset of the provincial VRI inventory unit). A sub-unit may be defined by a specific geographic area (e.g., operable landbase) or stand type (e.g., problem forest types) within the Forest District.

Target Precision

Target precision expresses the amount of variation in key attributes (e.g., timber volume) desired in the final results. Target precision is usually expressed as the sampling error. The variation in the population, is usually expressed as the coefficient t of variation (CV). The CV is used to calculate the minimum sample size for a given level of probability (risk) and desired sampling error.

Vegetation Resources Inventory (VRI)

VRI is an improved vegetation inventory process for assessing quantity and quality of BC's vegetation resources. The VRI process is designed to include a flexible set of sampling procedures

for collecting vegetation resource information. The VRI is essentially a toolbox of procedures, which include:

- *Photo-interpretation*: the delineation of polygons from aerial photography and the estimation of resource attributes.
- *Ground sampling*: the establishment of plot clusters in selected polygons to measure timber, ecological, and/or range attributes.
- *NVAF Sampling*: stem analysis sampling of individual trees for net volume adjustment.
- *WPV Sampling*: intensive sampling of selected polygons to determine the error between the estimated attribute values and the "true" attribute values.
- *Statistical Adjustment*: the adjustment of the photo-interpreted estimates for all polygons in an inventory unit or management unit using the values measured during ground sampling.

The VRI can be deployed over the entire province (provincial VRI) measuring timber and non-timber resources, or over a large management unit (management VRI) measuring selected resources in specific portions of the landbase. The VRI sampling process produces spatial and non-spatial databases that can be used in multiple resource management applications including timber, ecosystem, and wildlife habitat management.

Within Polygon Variation Sampling

WPV sampling provides information for expressing the true individual polygon error, assessed as the difference between the adjusted polygon value and the "true" value for that polygon. The "true" value for the polygon is an estimate derived from a small sample of polygons that are intensively sampled on the ground.

5. APPENDIX B - SAMPLE SELECTION PROCESS

(The following was provided by Gary Johansen of Resources Inventory Branch, May 5, 2001)

Attached is the sample list for the 2001 TFL 3 ground sampling project.

The population used for sample selection was the entire VT population > 20 years, for the data provided to me. Samples were selected from the entire population, then samples < 20 years removed for the final sample list. It is on the maps that are the same version as the attribute files that you must identify your sample location. It would be useful to burn the map files, the attribute files and the sample list onto a single CD.

Samples were selected using PPSWR procedures. 220 samples were drawn, in GROUPs of 55. Each GROUP of 55 samples represents the population and has been randomized. As you have requested 110 samples, the remaining samples have been hidden in the excel worksheet, but can unhidden when required.

To use these lists, beginning with GROUP A samples, start at the top of the list and work your way down, only skipping over samples that do not meet your sampling population criteria. Ideally you will complete each GROUP that you begin taking samples from, but this not absolutely necessary. If you do not plan to complete a list please contact the RIB biometrician.

I would recommend that this list ONLY be distributed (if necessary) with the maps/attributes that were used for this sample list, as this list is only valid for those files. I would also suggest that you keep a running set of notes documenting which samples are completed, which are dropped (and why), the sample map/poly (if different) on newer versions of maps, any replacement sample locations (old, new, reason), and a list of any other attributes associated with every sample that you feel may be important and we may not have access to (operability, biogeo, THLB(?), strata of interest for future analysis, etc.). Information relating to apparent 'mismatches' between the ground sample information and the map data, documented at the time of the ground sampling is also very valuable (ie holes, age/ht differences, etc.). This information will significantly simplify future analysis work. Copies of this information at the end of the field season would be welcomed and added to our records.
Printouts of all files should be appended to your PIP.
I think I have covered all bases. If anyone has any questions regarding this list, *please email to all to ensure we all have the same information.*

6. APPENDIX C - LIST OF SAMPLE POLYGONS

Sel Order	Project ID	Sample # - DO NOT CHANGE	Group	NVAF Mat/Imm	NVAF Sample	SPEC_CL	vol_cls	map_no	polygon	vol_tot	bc_lcs	ld_spec	bc_lev12	polyarea	NumberHits	add
6	3031	1	A	M		Balsam	1	082F051	2238	85.8	VTUTCOP	BL	VT	3.7	1	
12	3031	2	A	M		Balsam	2	082F061	1902	160.8	VTUTCOP	B	VT	6.0	1	
39	3031	3	A	I		F P L Deci	2	082F071	2011	322.1	VTUTCDE	PL	VT	104.6	2	
29	3031	501	A			Balsam		082F051	12	0.0	VTUTCSP	BL	VT	22.5	1	X
3	3031	5	A	I		Balsam	0	082F061	2462	38.8	VTUTCSP	B	VT	7.1	1	
26	3031	6	A	I		F P L Deci	0	082F062	1846	100.8	VTUTCOP	FD	VT	9.1	1	
45	3031	7	A	I		Spruce	0	082F062	1796	114.9	VTWTCOP	S	VT	11.1	1	
14	3031	8	A	I		Balsam	2	082F062	2642	173.6	VTUTCOP	B	VT	6.7	1	
20	3031	9	A	M	X	Cedar Hem	1	082F061	2578	229.3	VTUTCOP	H	VT	42.1	1	
16	3031	10	A	I		Cedar Hem	0	082F051	1571	28.7	VTUTCOP	H	VT	21.3	1	
25	3031	11	A	I		F P L Deci	0	082F061	2427	89.3	VTUTCDE	L	VT	13.4	1	
22	3031	12	A	M		Cedar Hem	2	082F072	1783	319.5	VTUTCOP	CW	VT	6.5	1	
36	3031	13	A	M		F P L Deci	2	082F062	1611	250.6	VTUTCOP	L	VT	9.8	1	
30	3031	14	A	I		F P L Deci	1	082F062	2311	154.2	VTUTCDE	L	VT	70.2	1	
33	3031	15	A	I		F P L Deci	1	082F071	2173	103.8	VTUTCDE	L	VT	45.3	1	
43	3031	16	A	I		Spruce	0	082F061	1863	105.9	VTUTCSP	S	VT	29.8	1	
37	3031	17	A	M	X	F P L Deci	2	082F062	1864	270.6	VTUTCDE	FD	VT	37.0	1	
42	3031	18	A	I		Spruce	0	082F061	74	0.0	VTUTCSP	SE	VT	156.4	1	
41	3031	19	A	M		Spruce	0	082F051	1794	80.5	VTUTCSP	SE	VT	3.3	1	
27	3031	20	A	I		F P L Deci	0	082F073	1526	32.5	VTUTMOP	AT	VT	7.3	1	
40	3031	21	A	I	X	F P L Deci	2	082F071	2011	322.1	VTUTCDE	PL	VT	104.6	2	
51	3031	22	A	M		Spruce	2	082F051	1901	253.1	VTUTCSP	S	VT	10.1	1	
55	3031	23	A	M	X	Spruce	2	082F072	1727	318.7	VTUTCOP	SE	VT	4.4	1	
44	3031	24	A	I	X	Spruce	0	082F061	2561	97.3	VTUTCOP	S	VT	34.3	1	
46	3031	25	A	M	X	Spruce	1	082F052	1768	167.1	VTUTCOP	S	VT	3.9	1	
38	3031	26	A	M	X	F P L Deci	2	082F071	1991	229.1	VTUTCOP	L	VT	6.9	1	
52	3031	27	A	M		Spruce	2	082F051	1905	232.4	VTUTCOP	S	VT	37.5	1	
31	3031	28	A	I		F P L Deci	1	082F062	2442	155.3	VTUTCOP	FD	VT	8.1	1	
7	3031	29	A	I		Balsam	1	082F061	1894	76.3	VTUTCSP	B	VT	22.6	1	
15	3031	30	A	M	X	Balsam	2	082F081	1589	197.8	VTUTCOP	BL	VT	45.9	1	
48	3031	31	A	M	X	Spruce	1	082F071	2094	173.2	VTUTCOP	S	VT	8.2	1	
9	3031	32	A	I	X	Balsam	1	082F063	1505	93.2	VTUTCOP	B	VT	44.7	1	
2	3031	33	A	M	X	Balsam	0	082F051	2220	48.6	VTUTCSP	B	VT	5.5	1	
35	3031	34	A	I	X	F P L Deci	2	082F061	2465	159.2	VTUTCDE	L	VT	38.8	1	
11	3031	35	A	M		Balsam	2	082F051	2036	129.6	VTUTCSP	B	VT	13.3	1	
1	3031	36	A	M	X	Balsam	0	082F051	2045	44.3	VTUTCSP	BL	VT	58.3	1	
13	3031	37	A	M		Balsam	2	082F061	2019	181.8	VTUTCOP	B	VT	9.8	1	
54	3031	38	A	I		Spruce	2	082F063	1556	259.4	VTUTCOP	S	VT	8.1	1	
49	3031	39	A	M	X	Spruce	1	082F072	2166	187.6	VTUTCOP	S	VT	12.2	1	

Sel Order	Project ID	Sample # - DO NOT CHANGE	Group	NVAF Mat/Imm	NVAF Sample	SPEC_CL	vol_cls	map_no	polygon	vol_tot	bc_lcs	ld_spec	bc_lev12	polyarea	NumberHits	add
47	3031	40	A	M		Spruce	1	082F071	1690	212.6	VTUTCOP	S	VT	51.3	1	
50	3031	41	A	M		Spruce	1	082F072	2295	225.2	VTUTCOP	S	VT	19.7	1	
24	3031	42	A	I	X	F P L Deci	0	082F052	1558	92.4	VTUTCOP	L	VT	10.6	1	
18	3031	43	A	I		Cedar Hem	0	082F061	1762	77.1	VTUTCDE	H	VT	58.2	1	
5	3031	44	A	M		Balsam	0	082F082	1506	52.2	VTUTCSP	B	VT	26.9	1	
10	3031	45	A	I	X	Balsam	1	082F071	1611	97.2	VTUTCSP	B	VT	82.5	1	
17	3031	46	A	I	X	Cedar Hem	0	082F052	1937	90.4	VTUTCDE	H	VT	76.2	1	
8	3031	47	A	M	X	Balsam	1	082F061	1909	116.7	VTUTCOP	B	VT	18.7	1	
28	3031	48	A	I		F P L Deci	1	082F052	1599	103.8	VTUTCDE	LW	VT	13.0	1	
19	3031	49	A	M		Cedar Hem	1	082F052	1910	235.4	VTUTCDE	H	VT	40.6	1	
21	3031	502	A			Cedar Hem		082F051	19	0.0	VTUTCSP	HW	VT	18.0	1	X
34	3031	51	A	I		F P L Deci	2	082F052	1574	207.1	VTUTCDE	L	VT	61.7	1	
4	3031	52	A	I		Balsam	0	082F072	44	10.7	VTUTCSP	BL	VT	40.2	1	
32	3031	53	A	I		F P L Deci	1	082F071	1982	115.6	VTUTCDE	L	VT	98.7	1	
23	3031	54	A	I	X	F P L Deci	0	082F052	53	0.0	VTUTCSP	LW	VT	10.9	1	
53	3031	55	A	M	X	Spruce	2	082F061	1505	230.8	VTUTCOP	S	VT	20.8	1	
101	3031	503	B			Cedar Hem		082F052	79	0.0	VTUTCOP	CW	VT	9.9	1	X
87	3031	57	B			F P L Deci	1	082F071	1647	119.3	VTUTCOP	FD	VT	38.4	1	
99	3031	58	B			Spruce	0	082F072	1963	133.1	VTUTCOP	S	VT	5.7	1	
67	3031	59	B			Balsam	2	082F062	2238	144.1	VTUTCOP	B	VT	28.9	1	
76	3031	60	B			Cedar Hem	2	082F051	1926	344.4	VTUTCOP	H	VT	17.6	1	
57	3031	61	B			Balsam	0	082F072	1586	43.1	VTUTCSP	BL	VT	22.3	1	
106	3031	62	B			Spruce	2	082F051	1534	370.8	VTUTCOP	S	VT	47.1	1	
80	3031	63	B			F P L Deci	0	082F061	1524	84.2	VTUTCOP	L	VT	46.9	1	
68	3031	64	B			Balsam	2	082F071	1511	253.4	VTUTCOP	B	VT	39.8	1	
61	3031	65	B			Balsam	1	082F061	1592	84.1	VTUTCSP	B	VT	55.5	1	
59	3031	66	B			Balsam	0	082F072	1704	33.0	VTUTCOP	BL	VT	5.1	1	
91	3031	67	B			F P L Deci	2	082F061	2106	178.7	VTUTCOP	FD	VT	7.0	1	
109	3031	68	B			Spruce	2	082F071	2139	440.0	VTUTCOP	S	VT	5.4	1	
102	3031	69	B			Spruce	1	082F051	2062	225.0	VTUTCOP	S	VT	44.1	1	
81	3031	70	B			F P L Deci	0	082F062	1740	61.5	VTUTMDE	EP	VT	35.7	1	
73	3031	71	B			Cedar Hem	0	082F071	2158	115.4	VTUTCDE	H	VT	27.6	1	
83	3031	72	B			F P L Deci	1	082F061	1523	128.4	VTUTCDE	L	VT	107.5	1	
82	3031	73	B			F P L Deci	0	082F071	1664	91.5	VTUTCOP	FD	VT	43.3	1	
78	3031	74	B			F P L Deci	0	082F051	1703	72.2	VTUTCSP	FD	VT	4.3	1	
63	3031	75	B			Balsam	1	082F061	2735	64.2	VTUTCSP	B	VT	28.6	1	
98	3031	76	B			Spruce	0	082F072	1683	107.0	VTUTCSP	S	VT	59.4	1	
104	3031	77	B			Spruce	1	082F071	1783	229.5	VTUTCOP	S	VT	166.3	1	
107	3031	78	B			Spruce	2	082F062	2241	259.6	VTUTCOP	S	VT	4.4	1	
103	3031	79	B			Spruce	1	082F052	1511	177.6	VTUTCOP	S	VT	7.5	1	
110	3031	80	B			Spruce	2	082F072	1966	282.9	VTUTCSP	S	VT	6.8	1	
95	3031	81	B			F P L Deci	2	082F062	2368	161.6	VTUTCDE	FD	VT	160.2	1	
72	3031	82	B			Cedar Hem	0	082F061	1924	32.6	VTUTCOP	H	VT	24.9	1	

Sel Order	Project ID	Sample # - DO NOT CHANGE	Group	NVAF Mat/Imm	NVAF Sample	SPEC_CL	vol_cls	map_no	polygon	vol_tot	bc_lcs	id_spec	bc_lev12	polyarea	NumberHits	add
92	3031	83	B			F P L Deci	2	082F062	1687	361.2	VTUTCDE	FD	VT	45.3	1	
71	3031	84	B			Cedar Hem	0	082F061	1919	93.8	VTUTCDE	H	VT	26.2	1	
100	3031	85	B			Spruce	0	082F072	2217	92.7	VTUTCOP	S	VT	11.8	1	
60	3031	86	B			Balsam	0	082F072	1868	44.7	VTUTCOP	B	VT	12.4	1	
64	3031	87	B			Balsam	1	082F062	2242	111.1	VTUTCOP	B	VT	98.0	1	
84	3031	88	B			F P L Deci	1	082F061	1929	125.7	VTUTCDE	PW	VT	24.0	1	
94	3031	89	B			F P L Deci	2	082F062	2330	187.3	VTUTCOP	FD	VT	42.7	1	
85	3031	90	B			F P L Deci	1	082F061	2472	105.7	VTUTCDE	L	VT	6.2	1	
62	3031	91	B			Balsam	1	082F061	2213	104.6	VTUTCOP	B	VT	23.1	1	
58	3031	92	B			Balsam	0	082F072	1689	53.8	VTUTCSP	BL	VT	81.2	1	
70	3031	93	B			Balsam	2	082F081	1590	204.5	VTUTCOP	BL	VT	30.5	1	
93	3031	94	B			F P L Deci	2	082F062	1744	165.9	VTUTCOP	L	VT	19.2	1	
97	3031	95	B			Spruce	0	082F062	1505	79.0	VTUTCSP	S	VT	9.4	1	
65	3031	96	B			Balsam	1	082F072	1668	110.4	VTUTCSP	BL	VT	7.4	1	
96	3031	97	B			Spruce	0	082F061	74	0.0	VTUTCSP	SE	VT	156.4	1	
74	3031	98	B			Cedar Hem	1	082F052	1530	195.2	VTUTCSP	H	VT	5.3	1	
86	3031	99	B			F P L Deci	1	082F061	2587	125.9	VTUTCOP	PL	VT	13.6	1	
105	3031	100	B			Spruce	1	082F072	1942	185.0	VTUTCSP	S	VT	6.0	1	
90	3031	504	B			Cedar Hem		082F052	43	0.0	VTUTCOP	HW	VT	21.6	1	X
108	3031	102	B			Spruce	2	082F071	1519	230.2	VTUTCOP	S	VT	8.0	1	
79	3031	103	B			F P L Deci	0	082F052	38	0.0	VTUTMDE	EP	VT	22.0	1	
66	3031	104	B			Balsam	2	082F061	2351	129.0	VTUTCOP	B	VT	25.8	1	
75	3031	105	B			Cedar Hem	1	082F062	2556	170.8	VTUTCDE	H	VT	17.1	1	
69	3031	106	B			Balsam	2	082F071	1763	208.2	VTUTCOP	B	VT	8.0	1	
89	3031	107	B			F P L Deci	2	082F052	1842	226.4	VTUTCOP	L	VT	19.2	1	
88	3031	108	B			F P L Deci	1	082F071	2159	145.1	VTUTCOP	FD	VT	7.3	1	
77	3031	109	B			Cedar Hem	2	082F062	1594	253.9	VTUTCDE	H	VT	24.6	1	
56	3031	110	B			Balsam	0	082F072	51	0.0	VTUTCSP	BL	VT	27.8	1	

The population used for the sample lists consists of all vegetated treed (VT) polygons for TFL3. PPSWR sampling was used to create the lists. Each sample list (Group field) is representative of the population. More than one sample list can be combined to achieve the desired number of samples. Ideally, each sample list should be completed, however, if only a portion of a list is required to complete the sampling, each list has been randomized and samples can be taken from the top of the list, working down. In all cases, should a sample be dropped, full documentation as to the reasons why and any actions taken to replace the sample will be required. Samples that fall outside of the population due to changes in the forest cover (ie logged) should have detailed notes. Plots that are replaced due to inaccessibility or danger should identify the alternate sample location (map/poly). Any question relating to whether or not a sample should be dropped should be addressed to Sam Otukol (387-3592).

NOTE: These sample locations valid only for the data used for sample selection (ie. must use the same map versions for ground sampling as those used to select samples).

7. APPENDIX D - COMPARISON BETWEEN THE POPULATION AND THE SAMPLE POLYGONS

An error in sample selection was detected following the original submission of this plan. Due to a programming error approximately 4% of VT population was not eligible for selection. This error was corrected and additional samples (4) were identified (500 series) for the missed area. As this difference would have a negligible impact on the sample to population comparison the attached population summary represents the original selection. The sample distribution was reviewed and approved by the RIB biometrician.

Population Area Class distribution

Area_cls	Sample Count	% of sample list	# of polygons	Population polygon area	Area percent
1. < 10	35	31.82	2846	13455.03	22.55
2. 10-25	27	24.55	1383	21471.55	35.98
3. 26-50	28	25.45	465	15873.93	26.60
4. 51-100	13	11.82	110	7091.91	11.89
5. 101-250	7	6.36	14	1777.95	2.98
	======	======	========	==========	=======
	110	100.00	4818	59670.37	100.0

Comparison of Sample and Population Species Distribution

Leading Species	Sample Count	% of sample list	# of polygons	Population polygon area	Area percent
	.	.	188	2488.50	4.17
AC	.	.	10	20.72	0.03
AT	1	0.91	34	252.65	0.42
B	20	18.18	1052	12853.13	21.54
BL	10	9.09	280	3168.81	5.31
C	.	.	2	73.11	0.12
CW	1	0.91	131	1563.62	2.62
D	.	.	7	28.18	0.05
EP	2	1.82	57	498.94	0.84
F	.	.	10	49.00	0.08
FD	11	10.00	582	8105.98	13.58
H	13	11.82	445	5670.32	9.50
HW	.	.	12	85.08	0.14
L	14	12.73	361	5571.49	9.34

LW	2	1.82	16	121.18	0.20
PA	.	.	7	92.81	0.16
PL	5	4.55	258	3488.26	5.85
PW	1	0.91	4	110.72	0.19
S	26	23.64	1275	14299.41	23.96
SE	4	3.64	89	1128.46	1.89
	110	100.00	4918	59670.37	100.0

Comparison of Sample and Population by BC LAND CLASSIFICATION codes

BC Land Classification System	Sample Count	% of sample list	# of polygons	Population polygon area	Area percent
VT	.	.	1	8.49	0.01
VTUTBDE	.	.	10	66.70	0.11
VTUTBOP	.	.	38	287.13	0.48
VTUTBSP	.	.	12	108.14	0.18
VTUTCDE	22	20.00	498	9561.91	16.02
VTUTCOP	57	51.82	2752	32452.54	54.39
VTUTCSP	27	24.55	1396	16027.08	26.86
VTUTMDE	2	1.82	13	125.88	0.21
VTUTMOP	1	0.91	59	653.53	1.10
VTUTMSP	.	.	27	300.52	0.50
VTWTBOP	.	.	1	0.08	0.00
VTWTCOP	1	0.91	3	56.09	0.09
VTWTCSP	.	.	5	21.74	0.04
VTWTMOP	.	.	1	0.28	0.00
VTWTMSP	.	.	2	0.26	0.00
	110	100.00	4818	59670.37	100.0

Comparison of Sample and Population by projected age class

Age class projected	Sample Count	% of sample list	# of polygons	Population polygon area	Area percent
.	.	.	186	2488.50	4.17
1	5	4.55	61	998.79	1.67
2	.	.	116	1430.55	2.40
3	7	6.36	294	3260.62	5.46
4	22	20.00	947	13973.47	23.42
5	16	14.55	503	6019.21	10.09
6	9	8.18	271	3073.59	5.15
7	4	3.64	307	3038.85	5.09
8	39	35.45	1760	20282.42	33.99
9	8	7.27	373	5104.37	8.55
	110	100.00	4818	59670.37	100.0

Comparison of Sample and Population by projected height class

Height Class projected	Sample Count	% of sample list	# of polygons	Population polygon area	Area percent
.	.	.	186	2488.50	4.17
1	9	8.18	314	3931.59	6.59
2	14	12.73	784	9464.58	15.86
3	53	48.18	1959	24127.57	40.43

4	28	25.45	1376	16724.23	28.03
5	5	5.45	191	2792.74	4.68
6	.	.	8	141.16	0.24
	110	100.00	4818	59670.37	100.0

Comparison of Sample and Population by site index

Site Index Class in intervals of 5	Sample Count	% of sample list	# of polygons	Population polygon area	Area percent
.	.	.	186	2488.50	4.17
5	2	1.82	149	2008.32	3.37
10	27	24.55	1261	14599.84	24.47
15	34	30.91	1596	18342.62	30.74
20	40	36.36	1274	16506.11	27.66
25	6	5.45	316	5187.10	8.69
30	1	0.91	34	480.92	0.81
35	.	.	2	56.96	0.10
	110	100.00	4818	59670.37	100.0

Comparison of Sample and Population by CROWN CLOSURE CLASS

crwn_cla	Sample Count	% of sample list	# of polygons	Population polygon area	Area percent
	.	.	186	2488.50	4.17
0	2	1.82	38	515.23	0.86
1	14	12.73	786	8595.37	14.40
2	12	10.91	569	6932.66	11.62
3	11	10.00	714	7778.95	13.04
4	16	14.55	827	9279.22	15.55
5	20	18.18	718	9361.12	15.69
6	15	13.64	581	7074.61	11.86
7	16	14.55	302	5488.00	9.20
8	4	3.64	96	2140.50	3.59
9	.	.	1	16.21	0.03
	110	100.00	4818	59670.37	100.0